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WHEN THE BABY BOOM GROWS OLD: Impacts on Canada's Public Sector

by

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Abstract

Canada, like many other countries, is experiencing a significant aging of its population. This trend is expected to increase the "burden" on the public sector of major cash transfer and in-kind benefit programmes. The estimated size of the burden depends on projections of demographic change, economic growth, and structural aspects of the major age-sensitive public-sector programmes. The burdens are analysed for 2016 and 2036, the period when demographic aging may be expected to have its most adverse impacts on old-age dependency ratios and public-sector programme costs. Contrary to many of the popularly expressed concerns, demographic aging is not the most important factor in determining future public-sector costs and revenues. Rather, aspects of the design and management of public-sector programmes represent the greatest area of uncertainty. These areas are more amenable to public policy initiatives and gradual adjustments within the half century time-frame of the projections.

Key words: taxes; public sector; program costs.

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1. Introduction

Canada, like many other countries, is experiencing a significant aging of its population. The "baby boom" was reflected in a peak of 3.9 in the fertility rate in the mid 1960s and was followed by a "baby bust" showing a sharp drop in fertility to 1.7 by the early 1970s. Fertility has remained roughly constant since that time. However, as pointed out in a recent IMF study [7] of seven major industrialized countries, Canada has the lowest expected public-sector costs associated with an aging population. Subsequently, Fellegi has undertaken a more detailed projection of the impacts of an aging population structure [4]. This paper is an update and extension of parts of the Fellegi analysis.

The main focus is the expected "burden" on the public sector of major cash transfer and in-kind benefit programmes in Canada. The expected burden will be analysed in relation to projections of demographic change, economic growth, structural aspects of the major age-sensitive public-sector programmes, and major sources of tax revenue. The conventional wisdom is that the expected aging of the population will have a major adverse impact on the public-sector burden. However, by analysing demographic changes in relation to economic growth, and programme and taxation structures, it becomes apparent that population aging is not always the most important factor.

This paper takes as its starting point estimates of government taxes and transfers which would have been collected in 1986 had the legislated 1990 tax/transfer system been applied. These results are compared to projections to 2016 and 2036. The year 2016 marks the time when the leading edge of Canada's baby boom cohort reaches age 65. The year 2036 marks the time when the trailing edge of the baby boom reaches age 65, and hence the period when demographic aging may be expected to have its most adverse impacts on old-age dependency ratios and public-sector programme costs.

2. Public-sector taxes and programmes

Three main groups of public-sector activity will be explicitly analysed -- taxes bearing more or less directly on households, major cash transfers, and major in-kind benefits.

Taxes considered in this analysis are personal income taxes (both federal and provincial), the payroll taxes used to fund the public contributory pension system (the Canada and Quebec Pension Plans or C/QPP) and Unemployment Insurance (UI), and the federal and provincial sales taxes borne by households. The latter taxes, to the extent that they are levied at intermediate levels of the production process, are assumed to be shifted forward to consumers.

The major cash transfers are the public pension programmes, unemployment insurance, child benefits, and welfare. The public pension programmes consist of several tiers. Unlike many countries, earnings-related pensions (the C/QPP) are a relatively small part of Canada's public pensions. The largest portion consists of a federal old-age demogrant (Old Age Security or OAS) and a guaranteed annual income benefit received by about half the over-65 population (the Guaranteed Income Supplement or GIS). Child benefits consist mainly of a universal demogrant for parents of children under age 18 called Family Allowance (FA). However, refundable income-tax credits in the personal income tax system have grown to account for about one half of the aggregate cash benefits in respect of children.

Unemployment insurance in Canada, in comparison to other OECD countries, is a very large programme; it is operated by the federal government. Finally, welfare, or Social Assistance benefits constitute the "social safety net" income-support programme of last resort. Neither of these programmes provide significant benefits to the elderly. However, they do tend to provide relatively more benefits to younger families due to the higher unemployment rates and incidences of single parenthood at young ages.

The two major in-kind benefit programmes for Canadian households are public education and health care. The former is clearly directed to the under-25 population, while health-care costs are particularly high for the elderly. Thus, it is reasonable to expect that changes in population age structure will have major impacts on the aggregate costs of these programmes.

3. The simulation approach

The projections that underlie this analysis are based on Statistics Canada's Social Policy Simulation Database and Model (SPSD/M). This is a publicly accessible PC-based microsimulation model of the principal federal and provincial taxes and cash-transfer programmes. The version used for this analysis is based on a detailed income distribution microdata file for 1986. (See [1] or [13] for a fuller description.)

The SPSD/M does not account for all taxes or in-kind transfers. Absent are corporate income taxes, municipal level taxes, and in-kind public benefits in areas such as housing and transportation, though the latter are quite small in Canada relative to education and health care. However, the model does account for over 60% of the National Accounts estimate of total federal and provincial direct and indirect taxes. Moreover, the taxes covered by the model and this analysis are those most sensitive to demographic changes. The SPSD/M database accounts for all cash transfers received by individuals. The major cash transfers, about 80% of total spending, are explicitly modeled, with the remainder coming from survey data.

For this analysis, the SPSD/M has been combined with a special reweighting algorithm. We constructed the projections in two basic steps. First, population and labour force participation effects are handled via the adjustment of survey weights. The 1986 population sample microdata file, the Social Policy Simulation Database or SPSD, is reweighted to reflect the population age structure by sex and five-year age groups as given by Statistics Canada's demographic projections for low, middle and high population growth scenarios and for the two target years (2016 and 2036). The three demographic projections are based on Statistics Canada's standard demographic projections [9] and correspond to fertility rates of 1.2, 1.67, and 2.1 in the low, middle, and high population growth scenarios respectively. Net migration is also assumed to increase from 65,000 for the low case to 110,000 for the high case.

Five year age/sex specific labour force participation rates for the year 2020 are also reflected in the reweighting and are drawn from the Chief Actuary of Canada's most recent projections for purposes of his triennial actuarial valuation of the CPP for Parliament [5]. (In this paper labour force participation is defined as persons having non-zero employment earnings.) This is particularly important because of the expected continuation of the increase in female labour force participation.

Given these projected population counts and labour force participation rates, an iterative approach to reweighting the SPSD sample is used that preserves the integrity of household weights, while at the same time assuring that distributions of individuals by age, sex, and labour force participation match the desired control totals. This reweighting process allows us to estimate what the aggregate tax revenues, programme costs, and income distribution would be if the 1990 tax and programme structures remained fixed (though as applied to households with 1986 demographic characteristics and incomes), but the population size and age structure as well as labour force participation rates were as projected.

The second step is to take account of legislated or possible changes in tax and programme structures. This step makes use of the explicit capability of the Social Policy Simulation Model (SPSM) to model the structure of selected major taxes and cash-transfer programmes for households on the (reweighted) Social Policy Simulation Database (SPSD).

A key question here is the indexing provisions of the personal income-tax system, associated refundable tax credits, and the cash transfers. Legislation has tied government taxes received from and cash transfers paid to the household sector to price or wage indices. The C/QPP and Unemployment Insurance programmes and payroll tax ceilings are effectively wage indexed, and the other old-age transfers programmes (OAS and GIS) are indexed to the Consumer Price Index (CPI). Recent legislative changes have amended the indexing of the Family Allowance (child demogrant) programme, the federal and provincial tax brackets, refundable income tax and non-refundable personal tax credits, and thresholds for the repayment of demogrant transfers by upper-income individuals to a rate equal to the CPI minus three percentage points.[1]

Another factor is the continuing maturation of the C/QPP. The Canada and Quebec Pension Plans were introduced in 1966 and became fully phased in by 1976. Thus by 1986 everyone age 65 to 75 had full C/QPP benefits, those between ages 76 and 85 had partial benefits, and those over 85 had no benefits. By 2016, the first target year of the analysis, everyone age 65 and over will be entitled to full C/QPP benefits. Moreover, past and projected increases in female labour force participation will entitle significantly more women to retirement benefits in the future. This expected maturation of the C/QPP has been simulated by imputing retirement and survivor benefits based in part on earnings distribution data from C/QPP administrative files. Corresponding to the projected increases in benefits payable from the C/QPP, payroll taxes rates are currently legislated to increase from the 3.6 percent rate in 1986 to rates of 9.69% and 13.25% in 2016 and 2036, respectively.

Simplified versions of the two major in-kind transfer programmes have been added to the SPSM. Age- and sex- specific average unit costs and enrollment rates for publicly funded education and health care have been estimated for 1986, the year of the SPSD. Five-year age groups have been used. Education is disaggregated into three parts: elementary and secondary, college, and university. Publicly funded health care has been disaggregated between institutional care (mainly hospitals) and ambulatory care (mainly doctor visits).

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1 In his Budget of 1985 the Minister of Finance stated that with respect to limited indexation of transfers that "the government will review the adequacy of payments in light of future circumstances and will increase them as resources permit".

In addition to the effects of changing age structure on these in-kind benefit programmes, two main kinds of structural changes have been analysed. One is changes in "enrollments". In the case of education, two enrollment scenarios have been examined. The first holds age/sex-specific enrollment rates fixed at their 1986 levels. The second seeks to capture expected trends in the under-five age group, representing explicit and implicit adjustments to accommodate strong public demands for improved day care, and a continuation of the increase in participation in the 20-24 age range in university. In the case of health care, the "enrollment" trends highlight the impacts of changes in age-specific rates of utilization. This is an area of uncertainty that has been omitted in virtually all previous projections of Canadian health-care costs (e.g. [4] [7] [8] and [2]). The two scenarios considered are 1986 rates and a 50% reduction in those rates. The latter scenario is suggested by the actual decline in overall utilization rates(bed-days per capita by age and sex) from 1971 to 1986 as well as the comparative experience in the United States (especially average hospital lengths of stay).

The other factor determining the aggregate costs of the in-kind programmes is unit costs (i.e. aggregate costs = source population x enrollment rates x unit costs). These costs have been rising faster than average wages over the past decade or so, particularly in education. While it may be unlikely that teachers', doctors' and nurses' incomes (the major components of unit costs) can continue to improve relative to other workers continuously for the next half century, it is instructive to examine the implications of recent trends.

We have no explicit data on unit costs. They have been inferred as the ratio of total costs to number of bed-days. Note that a decline in hospital lengths of stay ("getting them out quicker and sicker") may be associated with a rise in average inpatient illness severity and hence a rise in unit costs due to a need for more intensive care. Thus higher wage rates for health-care personnel is not the only possible reason for increasing unit costs over time.

Finally, it is important to note that the major aggregate results are being presented in the form typically preferred by actuaries -- aggregate tax revenues and programme costs are expressed as percentages of aggregate labour income (wages, salaries, and self-employment income) -- or aggregate wages for short. In this way, the analysis avoids presenting very large dollar numbers that reflect only inflation; and it allows the effects of real per capita economic growth to be placed in context. This method of presentation allows us to highlight the importance of income tax and cash-transfer programme indexing provisions, and trends in unit costs for eduction and health care, relative to demographic changes -- the key objective of the analysis.

4. Results

Projection scenarios

In order to examine the factors mentioned above, we have developed a series of nine projection scenarios. These scenarios show the cumulative impact of the main factors being analysed. We begin with (1) the 1990 status quo tax/transfer system as it would have applied in 1986 -- that is, the 1990 law applied to 1986 demography and family incomes. The next scenario (2) is identical except labour force participation rates as projected by the Chief Actuary for 2020 have been used. The next three scenarios also use the 1990 tax/transfer system and 2020 participation rates but add the effects of changes in the size and structure of the population according to (3) low, (4) middle, and (5) high population growth scenarios (driven mainly by different fertility-rate assumptions). The sixth scenario (6) adds the maturation of the C/QPP.

In these scenarios, economic variables are fixed at their current levels in 1986 dollars. The reweighting of the underlying sample to reflect projected changes in age structure to 2036, for example, is done without changing the dollar levels of pensions, income taxes and other dollar-denominated variables. It is important to note that this hypothetical 2036 scenario does not represent constant dollars in the usual sense. Rather, dollar magnitudes are held at their same relative position with respect to average wages. In effect, this "relative" scenario assumes that pensions, taxes and such are indexed to average wages, and are then deflated to "1986 dollars" using a wage rather than a price index. To the extent that over the long term average wages grow faster than prices, this relative indexing scenario implicitly assumes that pensions, for example, are indexed at a higher rate than prices such that they stay at exactly the same fraction of the average wage that they were in 1986.

The seventh scenario (7) adds the effects of legislated indexing of the tax/transfer system, building on the middle population growth scenario (5). For the C/QPP and Unemployment Insurance, this scenario is essentially no different from the sixth because these programmes are explicitly wage indexed. (The major exception is that C/QPP benefits, once they come into pay, are price rather than wage indexed.) However, for cash transfers and many aspects of the income-tax system, CPI (consumer price index) or CPI-3% indexing provisions apply. Implicitly, dollar items are indexed forward by either the wage index, the CPI, or CPI-3%, as appropriate, and then all deflated back to "1986 dollars" by the wage index. Mechanically however, this is simply equivalent to holding the wage-indexed items constant (as with all dollar variables in the previous scenarios), deflating the CPI-indexed amounts by the real per capita wage growth rate, and deflating the CPI-3%-indexed amounts by the real per capita wage growth rate plus three percentage points. Following the actuarial report for the CPP [5], we assume the same long-run growth rate of real per capita wages, 1.3% per annum. Thus, CPI indexing is equivalent to deflating the CPI-indexed amounts by 1.3% per annum, and those amounts like tax brackets which are indexed to CPI-3% by 4.3% per annum. As might be expected, these indexing differences can have very large impacts when cumulated over half a century.

The penultimate scenario (8) considers changes in "enrollments". A set of exploratory alternative assumptions have been made. For education, the alternative to current enrollments is increased enrollment rates in elementary and secondary in the under 5 age group, and in the university age 20-24 group. These projected changes are intended to capture the major recent trends in the case of post-secondary education, and the pressures for improved publicly funded day care and similar programmes (e.g. universal half-day kindergarten starting at age 3).

For health-care "enrollment", the key question is changes in the age-specific utilization rates. Hospital bed-days -- our best indicator of age-specific institutional care costs -- have been falling in the young- and middle-age ranges, but rising among the elderly. It is not at all clear that this is entirely due to increased morbidity amongst the elderly. Alternative hypotheses include so-called "doctor induced demand" where physicians, given their role in Canada as "gatekeepers" to the health-care system, assure sufficient referrals for treatment to maintain their caseloads and hence incomes. Alternatively, these trends could reflect "patient-induced demand" based on increased patient-initiated use of a publicly funded health care- system as well as actual increased morbidity amongst the elderly that has offset much of the reduced health-care utilization in other age groups. In total, however, utilization rates have been falling. In order to explore the salience of changes to these rates, the alternative of 50% of 1986 age-specific hospital utilization curves has been used. (The 1986 age- and sex- specific per capita hospital bed-day utilization rates have been taken from the data underlying [6].)

Finally, the last scenario (9) considers possible divergent trends in unit costs for the two in-kind benefit programmes. In order to illustrate the sensitivity of projected overall education and health-care costs, this last scenario assumes that unit costs will increase one percentage point per year faster than average wages.

Impacts of population changes

As a precursor to discussing the basic projection results for the public sector, it is useful to consider the more directly measurable impacts of changing population size and structure. One widely-used indicator is the dependency ratio. The usual "demographic" dependency ratio is the ratio of the number of individuals not in the 20 to 64 age range to the number who are. Given the importance of projected changes in female labour force participation, it is also informative to consider an alternative "labour force" dependency ratio -- the ratio of those not in the paid labour force to those who are.

The results for the three population growth and two labour force participation scenarios are shown in Figure 1. The top set of three curves shows the spread in labour force dependency ratios if 1986 labour force participation rates are held fixed and only the population age/sex structure is projected. The bottom three curves, on the other hand, all incorporate an additional adjustment to reflect the Chief Actuary's labour force participation projection for the year 2020 (the closest published projection year to our target years of 2016 and 2036, [5]). Note that the lower point for 1986 is the hypothetical result of applying projected 2020 participation rates to the 1986 population.

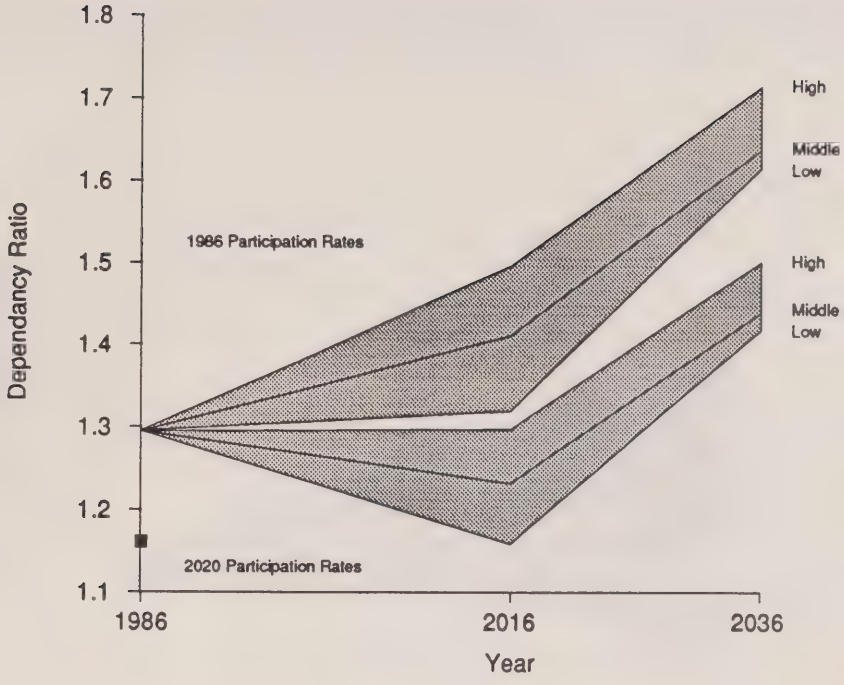

Fig. 1. "Labour Force" Dependency Ratios for Alternative Population Growth and Labour Force Participation Scenarios

These results clearly show the importance of labour force participation when thinking about future dependency burdens (as already noted by [3] and [4][1]). In terms of labour force dependency ratios, the effects of population aging are almost completely offset by increased numbers of women in the paid labour force in 2036. The ratio goes from about 1.3 non-participants per labour force participant in 1986 to about 1.2 in 2016 and then rises to about 1.4 in 2036 -- the most adverse year from the viewpoint of conventional old-age demographic dependency ratios. Relatively, the impact of alternative labour force participation scenarios on this form of dependency ratio in 2036 is almost twice the impact of alternative population growth scenarios.

Recall, however, that we shall express the burdens of public programmes and taxes as proportions of aggregate wages. In the set of projection scenarios we are considering, there are four factors that will affect real aggregate wages: labour force participation rates, population structure, population size, and

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1 The precise numerical results are slightly different than Fellegi (1988) due to a change in methodology, and the use of the Chief Actuary's recent projections rather than assuming an ultimate equalization of male and female participation rates.

real per capita economic growth. The impacts of these factors are shown in Figure 2 for the various projection scenarios -- giving aggregate wages in 2016 and 2036 as percentages of 1990 aggregate wages.

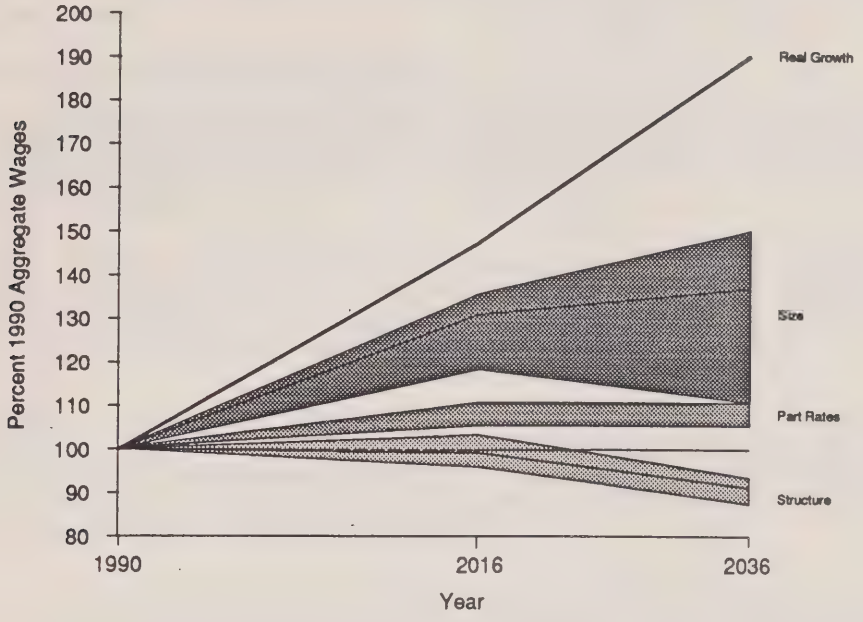

Fig 2. Projected Aggregate Wages as a Percentage of 1986 Aggregate Wages

If only female participation rates change as projected by the Chief Actuary [5], then aggregate wages would increase by about 6% (the bottom of the "Part Rates" curve). If increases in participation rates occurred amongst only those with strong labour force attachments (those earning the yearly minimum pensionable earnings -- about 2.5% of the average wage -- or more) then this figure would be 11% (the top of the "Part Rates" curve). Changes in age structure alone ("Structure"), on the other hand, would result in a decline in aggregate wages of from 6 to 13%, depending on the particular demographic scenario. Thus, leaving aside any associated changes in the size of the population, age-structure changes can be expected to have a similar impact to participation rate changes. The participation rate impacts on wages are thus somewhat muted in comparison with the results for the two kinds of dependency ratios shown in Figure 1 above, essentially due to the lower average earnings of women. We have not, however, taken into account the narrowing gap between average earnings of men and women [15]. The different sizes of the population (combined with the age structure changes in the "Size" curves) do show a substantial impact on aggregate wages.

Finally, the "Real Growth" curve in Figure 2 shows the pure effect of continuing real economic growth, in contrast with the demographic and participation effects. The real economic growth rate used is drawn from the CPP actuarial valuation [5], the figure that will be used later to assess the effects of

various indexing provisions in transfer programmes and income-tax provisions. As expected, the compounding effect of 50 years of 1.3% annual real wage growth on aggregate wages is large, resulting in a 90% increase in aggregate wages by 2036. This is nearly double the combined effects of projected changes in population size and structure and participation rates. Thus the major portion of the future tax base will be most affected by economic growth, followed in importance by demographic and participation rate changes.

Costs of major public-sector expenditure programmes

Figure 3 highlights the main results of the cost projections for the three major age-sensitive expenditure programmes under the middle set of demographic assumptions. These three programmes are health-care, education, and public pensions. Costs along the vertical axis are expressed as percentages of aggregate wages.

For the two in-kind benefit programmes, three scenarios are shown -- changing only the population structure and participation rates ("Age Only"), changing these plus age-specific enrollment rates ("Enrollments"), and finally also increasing costs per health-care visit or per pupil ("Unit Costs") at an illustrative rate 1% per annum faster than projected growth in real average wages.

For pensions, the first scenario, "Age Only", is the same as for the other two -- holding all pension programme benefits at their same relative positions in relation to average wages as in 1986. The second scenario adds the impact of the maturation of the C/QPP ("Maturation"). Finally, the third scenario for pension programmes shows the effects of currently legislated CPI or CPI-3% indexing if there is 1.3% per annum real per capita economic growth ("Indexation").

In general, the scenarios in Figure 3 have been chosen to show first the effects of changing age structure and labour force participation only, and then the cumulative impacts of two of the subsequent scenarios resulting in the highest and lowest projected costs. The exact percentages underlying the figure, as well as other details, are shown in Table 1 to which we shall turn in a moment.

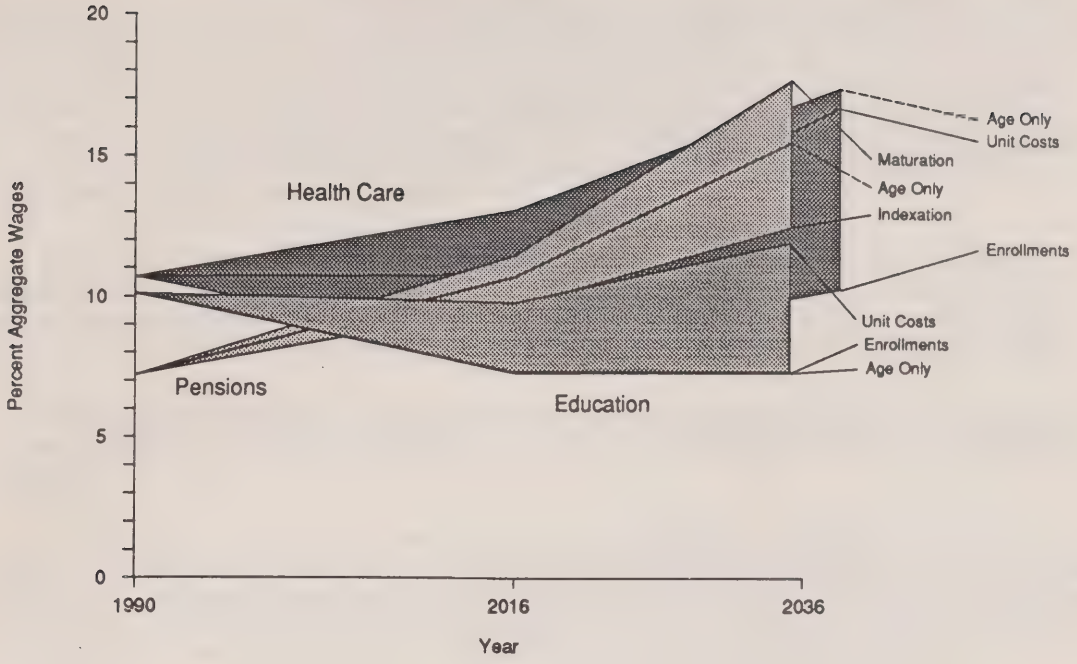

Fig. 3. Projected Pension, Health and Education Costs as Percentages of Aggregate Wages under Cumulative Alternative Scenarios (Age Only, then Enrollments or Maturation plus Age Only, then Unit Costs or Indexation plus all previous factors)

As might be expected, the aging of the population ("Age Only") leads to higher costs for public pensions and health care and to declines in costs for education. Figure 3 shows relatively smaller impacts for the two "Enrollments" scenarios. In the case of education, a major increase in under-age-5 enrollment (essentially 100% half-day schooling for ages 3, 4, and 5) combined with a 20% increase in university enrollment has negligible impacts on projected costs.

The situation with health care is somewhat different. There are very large uncertainties in any projection of future "enrollment rates" (measured as bed-days). Thus, we have chosen to illustrate the importance of health-care utilization by examinining as the alternate "enrollment rate" scenario exactly half the actual 1986 rates of hospital (not including nursing home) bed-day utilization for institutional care (physician and other ambulatory utilization is unchanged). Comparison of actual 1971 and 1986 sets of age- and sex-specific utilization rates (taken from data underlying [6]) show that despite increasing utilization by the elderly, overall utilization has declined. Figure 3 shows that if health-care utilization on the whole continued to decline at a similar rate to half of their current levels, "enrollments" would fall and by 2036 health-care costs would be at about their 1990 levels relative to aggregate wages, notwithstanding the aging of the population.

It is not clear how much the increased utilization of health-care or the "medicalization" of the health problems of the elderly will offset the trend toward lower utilization rates. If it does, then higher enrollments can be expected -- placing even greater pressure on overall health-care costs than is shown by the "Unit Costs" or possibly the age-only scenario. On the other hand, if lower-cost non-medical interventions for the elderly prove to be forthcoming, this will allow a reversal of recent "enrollment" trends among the elderly and will lead to a reduction in the growth rate of unit costs. This is clearly an area where investments in technology assessment and evaluations of the effectiveness of various medical procedures can have major payoffs.

Figure 3 shows that continued relative increases in unit costs for these two major government activities can have a large impact. At an assumed 1% per annum faster growth than the rest of the economy, increasing unit costs can more than reverse the decline in overall education costs, and can almost offset the projected decreases in health-care costs when compared to population aging alone.

(Note that large increases in wages in the health care and education sectors will show up as increases in aggregate wages for the economy as a whole. This arithmetical fact has been ignored in the analysis.)

Such increases in average unit costs are not out of line with Canadian experience over the past decade or so. Furthermore, these sectors of the economy are labour intensive and (more so in education than in health care) have not experienced nearly the technical progress and capital deepening of the rest of the economy. Continued "unbalanced productivity growth and asymptotic stagnation" in the sense of Wolff [11] is a real possibility that would be consistent with these "Unit Costs" scenarios.

The implication is that the management of unit costs is at least as important as aging in considering the public-sector burden of education and health care. In elementary and secondary education, the key factors include teachers' salaries and the increased proportion of additional staff (for example, curriculum advisors, special education teachers). On the other hand, post-secondary education costs increasingly represent the joint production of teaching and research. Thus, some of the cost increase in education might better be ascribed to the production of research rather than to higher unit costs for teaching.

In health care, increased unit costs have been driven by the adoption of more resource intensive methods of care -- ranging from more specialized physicians, more nurses per patient in intensive care units, to more expensive technology such as diagnostic imaging equipment. Here, the major challenge is to evaluate the efficacy of new forms of care and to control their diffusion. There is increasing concern that many high cost procedures are often undertaken inappropriately or with very limited expected improvements in patient health (e.g. some coronary bypass surgery), or even causing worse outcomes than no intervention at all.

Finally, Figure 3 shows the expected increases in overall pension costs associated with population aging, and the maturation of the C/QPP. The most important factor, however, which is not widely appreciated, is the cumulative impact of indexing legislation. The earnings-related C/QPP are essentially indexed to average wages so that their costs are the same in the "Relative" and "Legislated"

scenarios. However, the other major pension programmes are indexed to the CPI so that with a long-run assumption of 1.3% per annum real per capita wage growth, these programmes can be expected to shrink significantly relative to the average wage level.

Moreover, recent legislation has instituted a repayment of Old Age Security (OAS) pension and Family Allowance (FA) benefits by higher income individuals (over and above the fact that OAS and FA are included in taxable income). The threshold defining "higher income" is indexed to the CPI minus 3 percentage points, so that by 2036, the majority of the elderly are being treated as "higher income" individuals. This factor is not shown in Figure 3, but is shown in the next section and is discussed in a later section on the income distributional impacts of the various projections.

Detailed aggregate cost impacts

Table 1 gives detailed numerical results for each expenditure programme and tax. The top portion of the table gives aggregate costs for each expenditure programme as a percentage of aggregate wages for 1986 and for each of the projection scenarios. The next block of rows gives income and sales taxes. Finally, the last pair of rows shows two views of the net balance for the flow of taxes and expenditures between the government and household sectors.

As regards expenditure programmes and tax provisions, a somewhat different classification system is used to present a clearer picture of the main trends. Specifically, refundable income-tax credits which are legally provided under the income-tax act are shown separately as cash-transfer programmes. In structure they are virtually identical to the GIS (Guaranteed Income Supplement) programme for the elderly; aside from political considerations, they could just as easily be considered as expenditure programmes as income tax provisions. If they were netted from income taxes, the current Public Accounts and National Accounts treatment, their important roles would be obscured. Similarly, the repayments of the OAS and FA demogrants by higher-income individuals have been shown explicitly rather than being included in income taxes or netted against the corresponding programme expenditures.

Table 1.
Cumulative Effects of Scenarios on Tax/Transfer Programmes as Percentages of Aggregate Wages

Programme	1986		Results for 2036						
			Population Growth			Legislation		In-Kind Transfers	
	1990 System	2020 Part Rates	Low	Middle	High	Matur-ation	Index-ation	Enrol-ments	Unit Costs
Federal/Provincial Transfer Expenditures	**37.7**	**34.9**	*50.6*	**49.0**	*49.7*	**49.7**	**43.1**	**36.5**	**47.7**
In-Kind	20.8	19.7	*24.5*	24.9	*26.0*	24.2	24.2	17.6	28.8
Health Care Costs	10.7	10.1	*19.0*	17.5	*17.1*	17.0	17.0	10.3	16.8
Education Costs	10.2	9.6	*5.5*	7.4	*8.9*	7.2	7.2	7.3	12.0
Cash Transfers	16.9	15.2	*26.1*	24.2	*23.8*	25.5	18.9	18.9	18.9
Elderly	7.2	6.7	*18.0*	15.8	*14.9*	17.8	12.6	12.6	12.6
C/QPP	2.7	2.4	*5.8*	5.1	*4.8*	8.3	8.3	8.3	8.3
OAS	3.2	3.0	*8.7*	7.6	*7.2*	7.5	3.9	3.9	3.9
GIS/SPA	1.4	1.3	*3.5*	3.1	*2.9*	2.0	0.4	0.4	0.4
Family Allowance	0.8	0.8	*0.4*	0.6	*0.7*	0.6	0.1	0.1	0.1
Refundable Credits	1.0	0.9	*0.7*	0.8	*0.9*	0.8	0.1	0.1	0.1
Child Tax Credit	0.6	0.6	*0.3*	0.4	*0.6*	0.4	0.0	0.0	0.0
Sales Tax Credit	0.3	0.3	*0.4*	0.4	*0.4*	0.4	0.1	0.1	0.1
UI and Other Transfers	7.9	6.9	*7.0*	7.0	*7.2*	6.4	6.2	6.2	6.2
Federal/Provincial Taxes	**42.9**	**42.3**	*47.0*	**46.0**	*45.5*	**48.3**	**70.2**	**70.2**	**70.2**
Payroll Taxes	6.0	6.0	*5.9*	5.9	*5.9*	11.2	11.2	11.2	11.2
C/QPP	2.8	2.8	*2.7*	2.7	*2.7*	8.1	8.1	8.1	8.1
UI	3.2	3.2	*3.2*	3.2	*3.2*	3.1	3.1	3.1	3.1
Income Taxes	25.0	24.8	*27.5*	26.9	*26.6*	25.6	50.3	50.3	50.3
Income Taxes	24.9	24.6	*27.3*	26.7	*26.4*	25.5	48.9	48.9	48.9
OAS Repayments	0.1	0.1	*0.1*	0.1	*0.1*	0.1	1.3	1.3	1.3
Sales Taxes	11.9	11.5	*13.6*	13.1	*13.0*	11.5	8.6	8.6	8.6
Balance with Household Sector									
Net Cash Balance[1]	14.1	15.6	*7.4*	8.7	*8.7*	11.3	42.6	42.6	42.6
Net Fiscal Balance[2]	5.2	7.4	-3.6	-3.0	-4.2	-1.4	27.1	33.6	22.5

1 Equal to income taxes less cash transfers

2 Equal to income, payroll and commodity taxes minus cash and in-kind transfers.

The in-kind transfer costs shown in the table have already been discussed in connection with Figure 3, as have the public pension programmes ("Cash Transfers to the Elderly"). The table also shows the sensitivity of their costs to alternative population growth scenarios. Health care almost doubles in cost over the next half century as a proportion of aggregate wages, but is relatively insensitive to the specific demographic scenario, ranging from 17.1 under a high population growth assumption to 19.0 percent under a low assumption. Education, on the other hand, is both relatively and absolutely the most sensitive, ranging 3.4 percentage points from 8.9 to 5.5 percent of aggregate wages, or from 90% to just over half of 1986 costs depending on the demographic scenario.

Among the public pensions, the interactions are somewhat more involved. The three population growth scenarios all have the expected impacts on aggregate costs. The "Maturation" scenario column is almost identical to the middle population growth scenario column. The major difference is for the C/QPP which shows about a two-thirds increase in cost when it is fully phased in. (There is also a legislated tripling of the associated payroll taxes.) Because the income-testing provisions of the Guaranteed Income Supplement (GIS) include C/QPP benefits as income, there is an offsetting one third decrease in GIS costs. The increased C/QPP benefits are included in taxable income while the legislated increase in payroll taxes is tax deductible; the net effect is a reduction in income-tax revenues.

Given the maturation of the C/QPP, the next column shows the impacts of taking account of currently legislated provisions for indexing. These have a dramatic impact. The C/QPP, as already noted, are essentially unaffected because of their earnings-related character. However, OAS and GIS benefits are more than halved. This is particularly serious for the poorer elderly, as will be shown below. Furthermore, the other cash transfers -- Family Allowances and refundable tax credits -- essentially vanish. Their CPI-3% indexing causes them to decline by over 90%.

On the other hand, the indexing of basic personal credits and tax brackets to CPI-3% creates a very large "fiscal dividend". Over the half century to 2036, income-tax revenues almost double as a share of the economy from one-quarter to one-half of aggregate wages. In addition, the benefit repayments from higher-income individuals receiving OAS increase over ten-fold, since the threshold defining high income is indexed to CPI-3%. (The FA repayments which are not shown in the table do not increase noticeably because the CPI-3% indexing of the benefits themselves has already reduced them to insignificance by this time.)

Finally, the increased income taxes and benefit repayments and the reduced cash transfers associated with the "indexation" scenario result in lower disposable income which in turn is reflected in lower sales tax revenues.

These implications over the longer term of current legislated indexing provisions in the income tax and pension systems may not appear realistic. However, if they do not, it shows the likelihood that current indexing legislation will be amended.

The essential changes in the last two columns are for health care and education. These have already been discussed above in connection with Figure 3.

The second main part of the table concerns taxes. Most of the tax impacts have already been ;sed. Payroll and income taxes are not particularly sensitive to changes in labour force ipation or population age structure. Sales taxes show greater sensitivity, but this is primarily due anges in disposable income which are in turn due to changes in cash transfers and income taxes.

"deficit"

The last two rows of Table 1 show the net fiscal balance between the government and household ors accounted for by the specific expenditure programmes and taxes shown in the table. This is the verbial "bottom line" -- the net effects of the flows of the various taxes, cash and in-kind transfers on fiscal position of the federal and provincial governments. This is not the same as the deficit, since y a portion of government expenditures and revenues are being considered, albeit a major proportion. wever, to the extent that the remaining sources of revenue and expenditures of the federal and ›vincial governments are not sensitive to changes in population age structure or other factors ;idered in the various scenarios, then changes in the "Net Fiscal Balance" shown in the last row of table will equal changes in the joint federal/provincial deficit.

Two main definitions of the net fiscal balance are shown. The "Net Cash Balance" covers income axes and cash transfers. The "Net Fiscal Balance" is more inclusive, adding sales and payroll taxes on he revenue side and in-kind transfers on the expenditure side of the ledger.

Some of the scenarios have significant impacts on these fiscal balances. Specifically, projected changes in female labour force participation increase the net surplus position of the federal and provincial governments by one or two percentage points of aggregate wages. This is more than offset by a 7 to 11% swing to a net deficit position for the programmes and taxes considered when population aging is taken into account. The maturation of the C/QPP, with a much larger increase in payroll taxes than in benefits, moves the net balances back by about three percentage points.

But most dramatically, the legislated indexing provisions improve the government net balances (both "cash" and "fiscal") by about 30% of aggregate wages. This is a massive increase, about three times the current annual federal deficit. Again, these implications of the current indexing provisions may appear unrealistic. However, they accurately capture the existing legislation, and are consistent with the less alarmist analyses of Canada's national debt by more thoughtful commentators in the financial press [10].

Finally, changes to "enrollments" for the in-kind transfers, virtually all in health care, would increase the net fiscal balance by six percentage points. Given the "enrollments", however, the cumulative impact of 1% per annum faster increases in real "unit costs" would absorb about 11% of aggregate wages (subject to the caveat noted above).

Distributional impacts

The trends and factors considered in this analysis obviously affect more than government deficits. They can also have a profound affect on the distribution of income among families within the household sector. Figures 4 and 5 show the distributional impact of the status quo plus two scenarios on all families and on elderly families respectively.

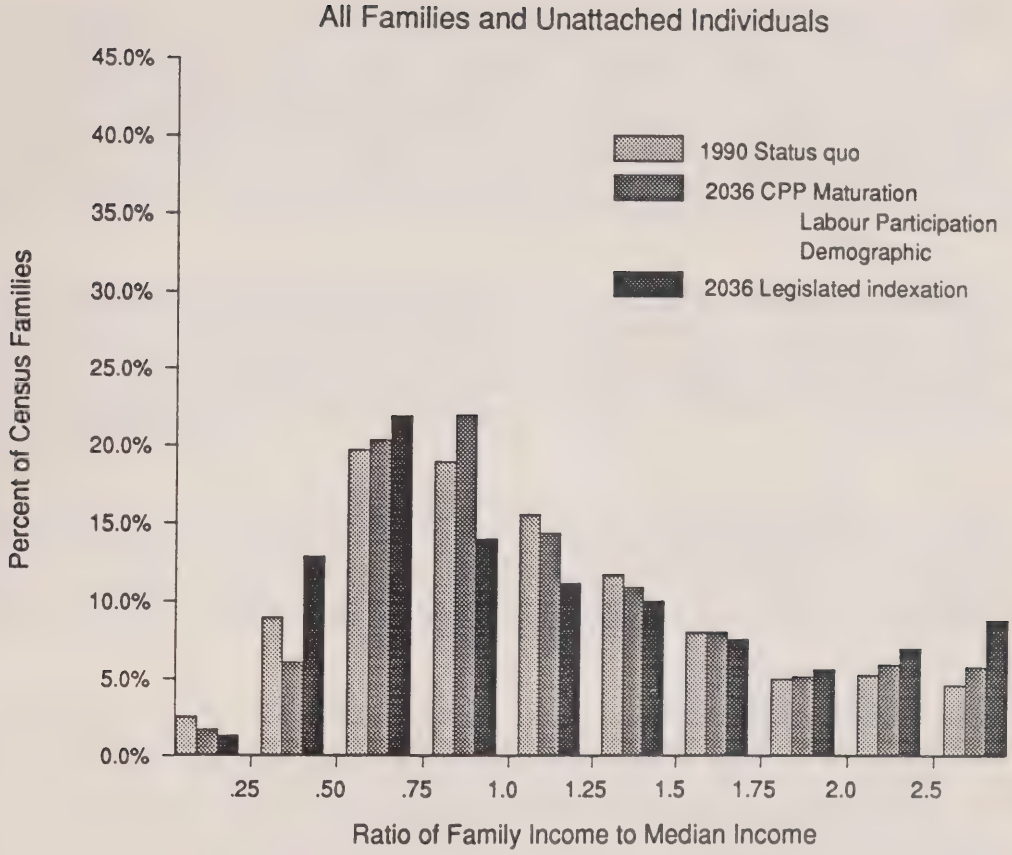

Fig. 4. Distributional Impacts for All Families

In both graphs, family income is shown in a somewhat different way than usual. First, each family's income was adjusted for family size and number of children based on an equivalence scale[1]. Next, the ratio of this adjusted income for each family to the median adjusted income for all families was computed. This ratio was used to rank families along the horizontal axis. Disposable income -- everything but in-kind transfers and sales taxes -- is the concept used in these calculations. The family unit is the census family -- similar to the nuclear family; it includes spouses and never-married children living in the same dwelling.

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1 An equivalence scale accounts for economies of scale in the family. For a discussion see Wolfson and Evans [14]. In this study we assumed equivalencies of .4 for second and subsequent adults and .3 for children.

Adjusted family income in proportion to the median is a useful way of displaying income distributions for an analysis such as this. Instead of using nominal or constant dollars, it provides a measure for which comparisons over half a century have some chance of being meaningful. Furthermore, many analyses define a poverty or "low income" line as 50% of (adjusted) median family income. If this definition is accepted, the incidence of low income can be simply read off the graphs as the proportion of families with incomes less than this threshold. Finally, there has recently been increased interest in the "disappearing middle class". The proportion of families with incomes between 75 and 150% of adjusted median family income is a reasonable indicator of the size of the middle class [12].

Figures 4 and 5 examine the same three scenarios -- the status quo (1986 population structure and market sources of income with 1990 tax/transfer programme structures -- corresponding to the first column of Table 1), the 2036 structure taking account of changes in labour force participation rates and population age structure and C/QPP maturation (and payroll-tax increases -- corresponding to the "Maturation" column of Table 1), and then including the effects of legislated indexing provisions (the third last column of Table 1).

Compared to the "status quo", the second of these scenarios is associated with a substantial movement of people out of relative income "poverty" -- the proportion of families below 50% of median adjusted income is lower while the proportion between 50 and 100% of median income increases by about the same amount. Above the median, the effects are disequalizing. Proportions of families with incomes between 100 and 150% of the median fall while proportions with incomes above 200% increase.

The effects of the legislated indexing scenario are not so mixed, however. There is a clear increase in the proportion of families with incomes below 75% of the median, including almost a doubling of the "poor" with adjusted incomes between 25 and 50% of the median. Between 75 and 175% of the median, there is a decline in the proportion of families in all the income ranges -- indicating a significant decline in the middle class. Finally there is a significant increase in the proportion of families with high incomes, particularly those over 250% of the median. Figure 4 thus suggests a strong regressive distributional impact associated with current tax/transfer indexing provisions compared to the current relative magnitudes of the relevant programmes and taxes.

The impact of these projected scenarios on the income distribution for the elderly is even more dramatic, as Figure 5 illustrates. The main factor influencing this income distribution in the second scenario is the maturation of the C/QPP. This scenario is associated with a movement of about 10% of elderly families from 50 to 75% of median income to 75 to 100% of median income range. More generally, the effects of this scenario appear distributionally progressive.

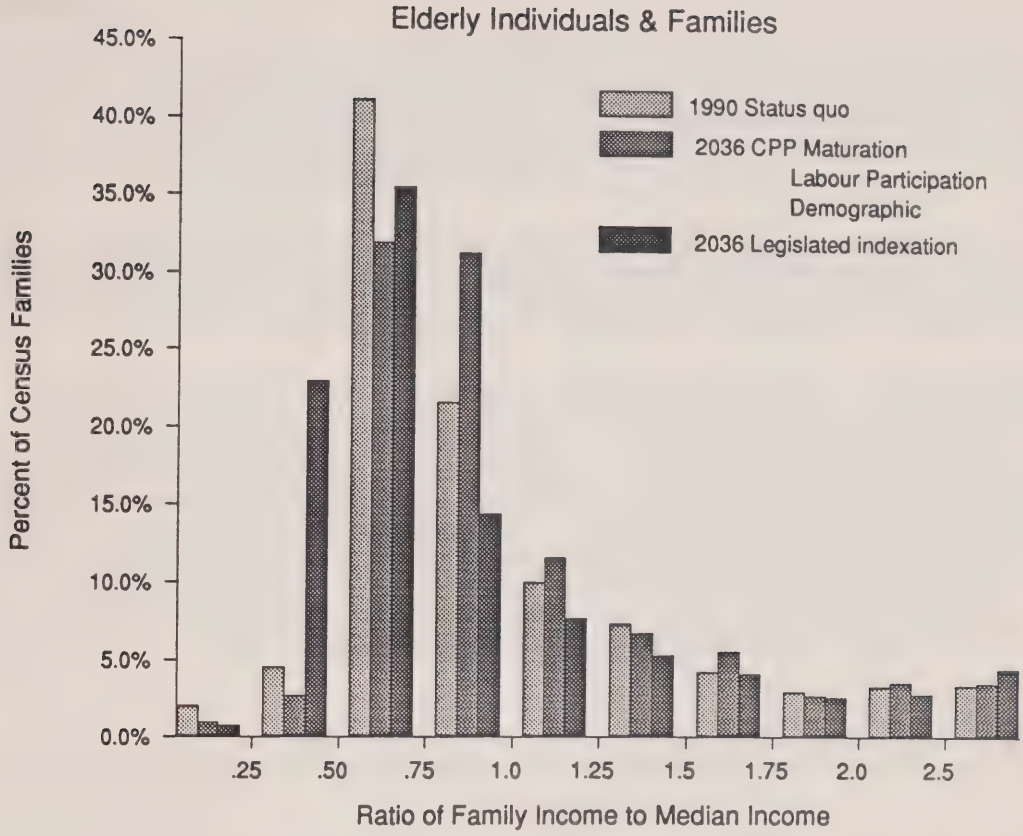

Fig. 5. Distributional Impacts for Elderly Families

However, the situation is more than reversed when account is taken of the legislated indexing provisions. There is more than a six-fold increase in the incidence of low income (less than 50% of the median) amongst the elderly, rising to almost one in four. At the same time, the proportion of elderly families with incomes between 75 and 175% of adjusted median (all family) income falls by almost 25 percentage points -- a drop of about one third in the number of middle-class elderly families.

These effects are due principally to the erosion of the non earnings-related public pensions (OAS and GIS) relative to average wages, since these programmes are indexed to the CPI, unlike the C/QPP which are effectively indexed to the growth in average wages. They are also attributable to the CPI-3% indexing of the "high income" threshold for repayment of OAS benefits. It should be noted, however, that these results may illustrate a worst-case scenario. Other factors not included in this analysis, such as an increase in private pension plan coverage and other private sources of retirement income, might offset the significant relative declines in public pension benefits being projected.

5. Conclusions

This study has examined the relative quantitative importance of a range of factors pertinent to the aging of Canada's population, and their effects on the public sector. The factors examined include population growth and aging, increasing female labour force participation, the maturation of the public pension system, unit costs and enrollment/utilization rates for publicly provided education and health care, and the indexing provisions of cash transfers and personal income taxes.

Based on alternative scenarios for each of these factors, the major public-sector expenditure programmes and taxes sensitive to these factors have been projected to 2036, the year when the "trailing edge" of Canada's baby boom will reach age 65. These projections support the general view that the increasing proportion of the elderly has the potential to increase public-sector costs substantially.

The analysis also helps to explain the possibly surprising result of a recent IMF study [7]. That study showed Canada facing the lowest public-sector cost pressures on account of population aging of seven major industrialized countries. This analysis shows that those results are attributable to the indexing provisions of the major public pension programmes. This analysis also shows that those lower cost pressures come at a price -- a major increase in the incidence of low income, especially among the elderly, and a reduction in the size of the middle class. The indexing provisions also result in a doubling of income taxes as a share of aggregate wages, and more than a 90% decrease in cash transfers for children over the next half century. The net effect over the long term is a significant public-sector surplus for the group of expenditure programmes and taxes considered in the analysis. To the extent this projection appears unrealistic, it suggests the likelihood that existing legislation will have to be amended.

Finally, the analysis considered the impacts of possible unit cost and enrollment/utilization trends for education and health care. The key conclusion is that these factors are potentially at least as important as population aging.

Generally, the analysis suggests that there are several factors other than population aging that are of major importance in projections of the future size and composition of the public sector in Canada. Unlike fertility, a key determinant of population aging, these other factors are much more amenable to public policy. In turn, this implies that the future public "burden" of an aging population can be anticipated, and adjustments made to balance competing concerns regarding costs, adequacy, and equity.

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